Subject: JEDI User's Guide (v2)
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1. Background

JEDI stands for Java EDR (Experimental Data Record) Display Interface. It is an essential EDR quick-view tool that has made important contributions to many past and current NASA/JPL space missions, such as Cassini, MER and Phoenix. However, being a monolithic java-based web application with tightly-coupled client and server components, it showed a sign of technical aging with increasing difficulty for mission adaptation. To better support future space missions, a task calling for a new design and re-implementation was defined and further funded by the MGSS office.

2. Architecture

Listed below are the main features of JEDI:

1. There is a complete separation of presentation from data and logic, which results in independent client and server sides, communicating only through clearly-defined APIs. As such, either side can evolve in its own path, thus is better positioned for easier and much more flexible updates with future web.

2. Some data models in JEDI contain rich science domain knowledge. They have been preserved and improved. Web functionalities are created from scratch leveraging on contemporary web technology.

3. The server side provides individual services covering login/logout, create/display/delete show, etc., all through well-defined APIs. These services can be consumed by the JEDI default client and any new future in-browser or desktop client.

4. The default JEDI client is an AJAX web client application that mimics JEDI client. It works in all major web browsers out of the box without any library dependency.

3. Server

The server is configured as a web application with a client interface. All images and files must be accessible from the web server installed. Authentication and authorization can be configured. Authentication is done via Kerberos verification. Authorization is done via LDAP verification.

The client interfaces with the server via a web interface to create the view needed by a project.

The JEDI server provides individual RESTful services that client interfaces with to create a complete application for the end user.

3.2 Services

Listed below are service endpoints that are supported in current implementation:

- http://hostname:port/jujube/login
- http://hostname:port/jujube/list
- http://hostname:port/jujube/create
- http://hostname:port/jujube/modify
- http://hostname:port/jujube/delete
- http://hostname:port/jujube/logout
- http://hostname:port/jujube/streamAppender
- http://hostname:port/jujube/play
- http://hostname:port/jujube/show

Most of them are access-controlled by auth credentials.

3.2 Web pages

Pages that are parts of the webapp:

- http://hostname:port/jujube/login.html
- http://hostname:port/jujube/list.html
- http://hostname:port/jujube/play.html

4. Client

The client uses a web interface to create a slideshow of images to be displayed. Each image file (FITS, ISIS, VICAR formats) is displayed together with meta information that is customized with a personality file. The image source can be from a list, a directory, or a stream.

4.1. Authentication and Authorization

Only an authenticated and authorized (A&A) user is permitted. A user must provide valid username and password to login. Authentication is done via Kerberos verification. Authorization is done via LDAP verification. If A&A is not activated, the user still has to provide a non-empty username and password. A&A can be turned on or off by modifying the tomcat5.conf file and passing the following parameter to tomcat when it starts:

-Djujube.auth=[true I false]

The LDAP server can be specified in the tomcat5.conf file as well:

```
-Djujube.ldap.url=ldap://miplauth-
dev.jpl.nasa.gov:389/dc=mipl,dc=jpl,dc=nasa,dc=gov
```

To login, use [hostname:port]/jujube/login.html. The default port is 8080.

Project	Environment	URL
Cassini	Development	http://tpsweb-dev/jujube/login.html
Cassini	Test	http://tpsweb-test/jujube/login.html
Cassini	Operations	https://tpsweb/jujube/login.html

Please contact your project representative to set up authentication and authorization credentials.

4.2. Create Show

After logging in, the user is presented with a form to create a show.

4.2.1. Select Role

The list of roles for the user is retrieved from the LDAP database. If authentication has been turned off, then there is only 1 role: PROJ. Select the role for your show.

4.2.2. Select Data Source

A show is created using either of two types of data sources:

- A file listing the names of the image files and an optional personality filename, or a directory accessible to the server machine that the JEDI application is hosted.
- An in-memory stream data source that can be populated and updated by the EDR generation pipeline or process via URL push, using a script called JediNewEdr. A stream stays alive (selectable) for 24 hours (default). This parameter can be overridden in the tomcat5.conf:
  `-Djujube.stream.idle=8`

4.2.3. Select Personality

The user has two choices for specifying personality:

- Use the default personality that has been defined in the LDAP database for the role. This is only valid when authorization has been enabled.
- Use a specific personality or a personality pointer file.

4.2.4. Set Show Name

A show is identified by a combination of creation time and username. If a name is given when the user creates the show, the show is listed by its name; otherwise, the software will generate a unique identifier for the show.

4.2.5. Pairing an Image File with a Personality File

In this case, there is no show-default personality. Note that the user can specify either show-default personality or personality pointer (See Sectionss 6 and 7 for how to define these files.)

When the data source is a directory or a stream, if there is a default personality, it will be used; otherwise, a personality will be chosen according to the personality pointer file.

The data files listed in a list can have an optional personality file assigned to it. The image file is listed with this personality file; however, if there is no personality file given, then the default personality file will be used.

4.2.6. List of shows

A user can create an arbitrary number of shows, private to the user. Created shows are listed in a table at the top of the page. Each row corresponds to a show that can be played and deleted. A show is identified by a combination of creation time and username. If a name is given when the user creates the show, the show is listed by its name; otherwise, the software will generate a unique identifier for the dhow.

In the current implementation, shows persist only in server instance memory and will disappear after a server reboot. It is planned to make them survivable over server reboots.

4.3. Browse Show (currently disabled)

To browse a show, click on the "browse" link. A "folder-like" page view of the show will be presented.

On this page, each member entry corresponds to a EDR file, which, in turn, can be clicked on and "opened" like a "folder". This process is traversing till to the end, when there is no more links. On each "folder-like" page, there are also links to meta-info in JSON format, which are helpful to developers who are creating new clients.

Technically, the "folder-like" page view of a show is the simplest html view of a webified "data store", which, in this case, is a show.

4.4. Play Show

To play a show, click on the "play" link. A new browser window will be spawned.

In this new window, EDR files contained in the show are displayed one by one in default frequency set up when the show was created. To change the display speed, or tune the show in general, users can simply click anywhere in the window to hide the "slide show". Now in the same window, the form for modifying show behavior will appear, along with show parameters. Try to change some, and click on “Watch The Show”, the change will take effect right way.

4.5. Delete Show

To delete a show, just click on the "delete" link.

4.6. Logout

A user logs out by clicking on the "logout" link. In current implementation, a logged-in user will be auto-logged out after a period of inactivity. The default idle time is 10 min (600 sec). When logged out, whether auto or not, created shows will still be alive.

5. Personality and Personality Pointer Files

Personality files are simply ASCII text files that contain component parameters that tell the server how the data will be displayed in the JEDI display window. The file can contain JEDI window component parameters or can be a list of pointers to other personality files to be used when displaying images. The client and server will reference and adhere to this file in presenting the EDR data to the user. The personality file must be viewable by the tomcat server.

5.1 Notations Used

The lines beginning with '#' are comments.

5.2 Personality Types

There personality file can either be of type PERSONALITY or PERSONALITY-POINTER.

A PERSONALITY type file contains the parameters for formatting the display. The first line of this type of file should be exactly like this:

```
# Content-type: PERSONALITY
```

A PERSONALITY-POINTER file is a file containing references to other PERSONALITY files and controls the number of instances the personality is used. The first line of a personality pointer file should be exactly like this:

```
# Content-type: PERSONALITY-POINTER
```

Personalities are required to have a version number, which can be specified by beginning a line with "# version". Other lines that start with a pound (#) sign is a comment, and will be ignored by the personality parser. On the other hand, personality pointers are not to have a version or comments.

6. Personality Parameters

The following sections list the parameters for a personality file. The mandatory property is PersonalityName. Other ones are optional.

Syntax for the property names and values are as follows:

- Property name is in camel case and case-sensitive.
- Property values take in standard css value if applicable. For possible values, please check any good online css reference such as http://www.w3schools.com/css/css_reference.asp

6.1 Personality Name

Each personality file must have a personality name usually the name of the instrument and will be used to match the role that the user has been assigned to. The name is case insensitive. The default name is PROJ.

```
PersonalityName=PROJ
```

6.2 Display Geometry

The DisplayGeometry allows the user to specify the location and dimensions of the JEDI window.

- **x** and **y** are attributes that tell the server to display the JEDI window at the **'x'** row, **'y'** column position on the User's Desktop Display.
- **width** and **height** are attributes that tell the server to display the JEDI window of the provided width and height sizes in pixels.

```
DisplayGeometry[x=10, y=100, width=620, height=600]
```

6.3 InstrumentDNScale

InstrumentDNScale specifies how to scale the pixel data number values (DNs) into a 0-256 range.

- The **short** attribute tells JEDI how many bits are used for the DN range from the instrument. This helps in scaling as many cameras of late use 12-bit ranges. Since such values are stored as 16-bit shorts, the short=12 specification helps JEDI knows how many bits are actually used to convey the DN from the instrument readings.
- The **byte** attribute is for the same use. Typically, this will always be set to 8. It is included here simply for completeness. Also, if ever there were an instrument that used less than a bytes worth of DN range, this might be helpful.
- You may enter a value of -1 for to **byte** and **short** if the user desires JEDI to perform auto scaling, i.e., let the software figure out the range and scaling.

```
InstrumentDNScale[byte=8, short=12]
```

6.4 IgnoreValues

IgnoreValues specify which pixel data number values (DNs) will be ignored when calculating the mean, max, min values etc. This enhances the quality of the picture by ignoring the saturated points, for example. You may have up to 10 ignored values. Index starts from 1.

```
IgnoreValues[1=4095, 2=255]
```

6.5 Ignore Range

IgnoreRange is for specifying a bigger range of pixel data number values (DNs) to be ignored. Any value <= the lower value or >= the upper value will be ignored.

```
IgnoreRange[lower=0, upper=4095]
```

6.6 EDRCanvas

EDRCanvas specifies the information related to the EDR:

- The **name** attribute is the name of the EDR canvas
- The **x, y, width**, and **height** attributes specify the geometry of the canvas.
- The **stretchType** attribute can be percent or linear, and is the stretch method used.
- The **param0** and **param1** attributes are the lower and upper limits fo the stretch.
- The following 5 attributes are optional, but must be specified as a group. If you just specify 1 to 4 parameters, the special check is not performed.
    - **minBelowBg** specifies the absolute minimum.
    - **minLowerLimit**
    - **minDifference**
    - **minAbsolute**
    - **maxAboslute**
- The following 4 attributes are optional, but must be specified as a group. i.e., if you just specify 1 to 3 parameters, the special check is not performed.
    - **missingLineDN** specifies the value that indicates a missing line.
    - **missingLineR**, **missingLineG**, and **missingLineB** are the RGB values for the pixel with with a matching missingLineDN.

```
EDRCanvas[name=iss, x=30, y=10, width=256, height=256,
stretchTyp = percent, \param0=0.001, param1=0.001,
minBelowBg=15.0, minLowerLimit=30.0, minDifference=50.0,
\minAbsolute=0.0, maxAbsolute=4095.0, missingLineDN=0,
missingLineR=255, missingLineG=255, \missingLineB=0]
```

6.7 GreyWedge

GreyWedge is a grey bar that shows the gradiation of the DN color scale from 0 to 255.

- The **x, y, width**, and **height** attributes specify the geometry of the canvas.
- **ascending** steps of gray in the wedge. false means descending.
- **vertical** display of the grey wedge*.* false means a horizontal display.
- **steps** is the number of steps shows in the grey wedge, value is between 1

and 256

```
GreyWedge[name=iss, x=11, y=10, width=16, height=256,
ascending=false, vertical=true, steps=256]
```

6.8 HistogramCanvas

HistogramCanvas specifies the information related to the histogram:

- **name** is the name of the histogram
- **x, y, width** & **height** specifies the geometry of the canvas.
- **axis** specifies whether the histogram is shown as log or linear.

```
HistogramCanvas[name=iss, x=330, y=480, width=256,
height=100, axis=log]
```

6.9 IconCanvas

IconCanvas specifies the information related displaying an icon:

- **x & y** specifies the location of the icon
- **URL** specifies the location of the image used for the icon

```
IconCanvas[x=520,y=10,URL=[https://tpsweb.jpl.nasa.gov/Je
di/images/casslogo_4.gif]
```

6.10 KeywordCanvas

KeywordCanvas specifies the information related to displaying a keyword:

- **x** and **y** specifies the location of the keyword
- **keyword** is the tag used to match the keyword in the EDR label for retrieving the value
- **value** is a place holder to indicate that there's a value associated w/ this keyword
- **show** is the text for the keyword that is displayed
- **delimiter** specifies the symbol used to separate the keyword and its value.
- **color** specifies the color of the text
- **alarmValue** & **alarmColor** specifies the special alarmed condition
- **alarmOp** is the alarm operation that will be used to determine if the current value is in alarm condition.
    - 0 means no comparison,1 is for =, 2 is for !=, 3 is for >, 4 is <.
- **evaluatedAsString** is set to false if the comparison is not on numbers; otherwise it's true.
- **fontsize** specifies the font size

```
KeywordCanvas[x=330,y=20,keyword=ANTIBLOOMING_STATE_FLAG,
```

```
value=---
,show=Antiblooming,\delimiter=:,color=FFFF00,alarmValue=,
alarmColor=FF0000,alarmOp=0,evaluatedAsString=true,\fontS
ize=14]KeywordCanvas[x=330,y=40,keyword=CALIBRATION_LAMP_
STATE_FLAG,value=---,show=Cal.
Lamp,\delimiter=:,color=FFFF00,alarmValue=,alarmColor=FF0
000,alarmOp=0,evaluatedAsString=true,\fontSize=14]
```

6.11 Additional Property Values

The following table lists the additional values for the given properties:

Property Name	Additional Property Values
DisplayGeometry	backgroundColor, backgroundImage, backgroundRepeat
EDRCanvas	maskBorderThickness, maskBorderColor
IconCanvas	Property URL
KeywardCanvas	a keyword group leader must have property group
KeywordCanvas	a keyword group leader can have properties color, fontSize, fontWeight, fontFamily and align. Please note that align is not a css property and its value can be one of left, right, delimiter. left is the default

7. Personality Pointer Files

The personality pointer files references other personality files. Each line, after the first line, in the file can either be a blank line, or a pair of number and absolute file paths. The show will rotate through the list of given personality files to be applied to the image source.

Personality Pointer Example:

```
# Content-type: PERSONALITY-POINTER
3 /personalities/per_1.txt
2 /personalities/per_2.txt
```

In this example, the first three slides of the show will be displayed using per_1.txt, the next two slides will be displayed using per_2.txt, the next three with per_1.txt, the next two with per_2.txt, and so forth. This rule holds true whether the show is looping or not.

8. Application Features

8.1 Mini Show Meta Info

In the “My Shows” section of the list.html page, users can hover over the show’s “`play`” or “`delete`” links to see the show’s creator and its source displayed near the mouse pointer.

8.2 Looping

If the data source is a directory or a list file, the show can display the data again and again once it has displayed all of the data. This option is not available for stream source.

To activate the option, please choose “Loop through files” when creating the show.

8.3 Start Show with Latest Data

If the data source is a stream, the play of the show always starts with the latest data item in the stream and continues to only display data that comes later.

To activate this option, please choose “Start with current EDR” when creating the show.

8.4 Sample Rate

Sample rate is the time a slide is displayed until it’s replaced by the next slide. Users can change this by clicking on the slide to get to its control panel. The acceptable range is 1-50. However, please note that if you have a slow client and choose a sample rate of 1, the client may not be able to refresh quick enough and may result in missed images.

8.5 Stretch Parameter and Band

Stretch Parameter and Band are display parameters of an EDR. Changing these parameters affect the image display of that EDR. Each slide can contain more than one EDR. For example, Cassini’s ISS slide contains one EDR per slide while Cassini’s VIMS slide contains two EDRs per slide. Consequently, there should be as many Stretch Parameter controls as there are EDRs. In the case of VIMS, this rule also applies to Band controls.
To get to the control, users can click on the slide to get to the control panel.

8.6 Auto Window Resize

By the default, for each slide, the play window will automatically resize to the DisplayGeometry specified in the personality of the slide. To deactivate this feature, users can click on “Turn resize off” in the control panel. To reactivate the feature, users can click on “Turn resize on” in the control panel.

8.7 Debug

To inspect which data file is being displayed and how many slides have been displayed, users can click on “Turn debug on” in the control panel. Once debug is on, the data file’s name and the total number of slides so far is displayed on the top left of the play window.

8.8 Help

For help to use JEDI, users can click on the “Help” link at the top of list.html.

9. Input Update

Input to a show is both the data source and the personalities. This section discusses how the client software handles changes in the show's input.

9.1 Directory Source Update

When data is added, deleted, or modified in the directory, the changes should be reflected in the show after a twenty-second delay.

9.2 List Source Update

Similarly to a directory source, when EDR-personality pairs are added or deleted in the list, the list is modified entirely, or items are no longer paired with the same personality, or any personality at all, the changes should be correctly reflected after a twenty-second delay.

9.3 Stream Source Update

Unlike directory or list source, stream source only has added data instead of deleted data. However, new data can be added to a stream at random time before the stream expires. As long as the show is running, new data should be displayed as soon as the display rate allows unless there is data that has not yet displayed.

9.4 Personality Update

JEDI currently does not detect personality updates.

9.5 User's Modifications to Show

Users' changes to Stretch Parameter and Band are not persistent to personality file or to the show's internal data. Whenever a show is played, it starts with the same values for Stretch Parameter and Band. Moreover, changes to Stretch Parameter and Band while the show is playing should be reflected as soon as the next slide that uses the same personality.

10. Known Issues

10.1 Stalking Play Window

When auto-resizing feature of the play window is turned on, if the user minimizes the play window, it will un-minimize as soon as the next slide. Moreover, if users are using Common Desktop Environment (CDE), the play window will follow them to their current workspace.

10.2 Stale Play Window

When connection to the server is lost long enough while a show is playing, the play window gets stuck at its last slide and won't close nor move on. Connection loss may due to server down, client's Ethernet cable coming loose, or router being reset.

10.3 Persistent Debug Info

Occasionally, it takes two or three tries to turn off debug option in the play window.

10.3 Persistent Debug Info

The stream mode does not work when A&A has been turned off. See AR-116885 (https://cmsas.jpl.nasa.gov/aams/cgi-bin/view.asp?AR=116885) for details.

Appendix A: Example of a Cassini Personality file

```
# Content-type: PERSONALITY
# version 1.1.0
# Each personality file must contain a PersonalityName.
# This is usually the name of the instrument.
# It will be used to match the role that the user has been assigned to.
PersonalityName=CASISS

# DisplayGeometry lets the user specifies the x, y location of the
# JEDI window (applicable for stand-alone version only) and the
# width and height of the window.
DisplayGeometry[x=10, y=100, width=620, height=600]

# InstrumentDNScale specifies how to scale the DN's into a 0-256 range.
# The short specification tells JEDI how many bits are used for the DN range
# from the instrument. This helps in scaling as many cameras of late use
# 12-bit ranges. Since such values are stored as 16-bit shorts, the short=12
# specification helps JEDI knows how many bits are actually used to convey
the
# DN from the instrument readings. The byte specification is for the
# same use. Typically, this will always be set to 8. It is included here
# simply for completeness. Also, if ever there were an instrument that used
# less than a byt'es worth of DN range, this might be helpfu.
# You may enter a -1 for auto scaling, i.e., let the software figure out
# the range and scaling.
InstrumentDNScale[byte=8, short=12]

# IgnoreValues specify which values will be ignored when calculating
# the mean, max, min values etc. This enhanced the quality of the
# picture by ignoring the saturated points, for example. You may
# have up to 10 ignored values. Index starts from 1.
IgnoreValues[1=4095, 2=255]

# IgnoreRange is for specifying a bigger range of values to be
# ignored. Any value <= the lower value or >= the upper value will
# be ignored.
IgnoreRange[lower=0, upper=4095]

# EDRCanvas specifies the information related to the EDR:
#   name is the name of the EDR canvas
#   x, y, width, & height specifies the geometry of the canvas.
#   stretchType can be percent or linear, and is the stretch method used.
#   param0 and param1 are the lower and upper limits fo the stretch.
# The following 5 parameters are optional, but must be specified as a group.
i.e.,
# if you just specify 1 to 4 parameters, the special check is not performed.
#   minBelowBg specifies the absolute minimum.
#   minLowerLimit
#   minDifference
#   minAbsolute
#   maxAboslute
# The following 4 parameters are optional, but must be specified as a group.
i.e.,
# if you just specify 1 to 3 parameters, the special check is not performed.
#   missingLineDN specifies the value that indicates a missing line.
#   missingLineR, missingLineG, & missingLineB are the RGB values for the
pixel w/
#    with a matching missingLineDN.
EDRCanvas[name=iss, x=30, y=10, width=256, height=256, stretchTyp = percent,
\
param0=0.001, param1=0.001, minBelowBg=15.0, minLowerLimit=30.0,
```

```
minDifference=50.0, \
minAbsolute=0.0, maxAbsolute=4095.0, missingLineDN=0, missingLineR=255,
missingLineG=255, \
missingLineB=0]

# GreyWedge is a grey bar that shows the graduation??
GreyWedge[name=iss, x=11, y=10, width=16, height=256, ascending=false,
vertical=true, steps=256]

# HistogramCanvas specifies the information related to the histogram:
#   name is the name of the histogram
#   x, y, width & height specifies the geometry of the canvas.
#   axis can be log or linear. It specifies whethe the histogram is shown as
log or linear.
HistogramCanvas[name=iss, x=330, y=480, width=256, height=100, axis=log]

# IconCanvas specifies the information related to the icon:
#   x & y specifies the location of the icon
#   URL specifies the location of the image used for the icon
IconCanvas[x=520, y=10,
URL=https://tpsweb.jpl.nasa.gov/Jedi/images/casslogo_4.gif]

# KeywordCanvas specifies the information related to a keyword:
#   x & y specifies the location of the keyword
#   keyword is the tag used to match the keyword in the EDR label for
retrieving the value
#   value is a place holder to indicate that there's a value associated w/
this keyword
#   show is the text for the keyword that is displayed
#   delimiter specifies the symbol used to spearate the keyword and its
value.
#   color specifies the color of the text
#   alarmValue & alarmColor specifies the special alarmed condition
#   alarmOp is the alarm operation that will be used to determine if the
current value
#     is in alarm condition. 0 means no comparison, 1 is for =, 2 is for !=,
3 is for >,
#     4 is <.
#   evaluatedAsString is set to false if the comparison is not on numbers;
#     otherwise it's true.
#   fontsize specifies the font size
KeywordCanvas[x=330,y=20,keyword=ANTIBLOOMING_STATE_FLAG,value=---
,show=Antiblooming,\

delimiter=:,color=FFFF00,alarmValue=,alarmColor=FF0000,alarmOp=0,evaluatedAs
String=true,\
   fontSize=14]
KeywordCanvas[x=330,y=40,keyword=CALIBRATION_LAMP_STATE_FLAG,value=---
,show=Cal. Lamp,\

delimiter=:,color=FFFF00,alarmValue=,alarmColor=FF0000,alarmOp=0,evaluatedAs
String=true,\
   fontSize=14]
```

Appendix B: Example of a Personality Pointer file

```
# Content-type: PERSONALITY-POINTER
3 /full/path/to/personalities/per_1.txt
2 /full/path/to/personalities/per_2.txt
```